

Two-sided Matching for Navy Enlisted Detailing: Deferred Acceptance vs. Linear Programming

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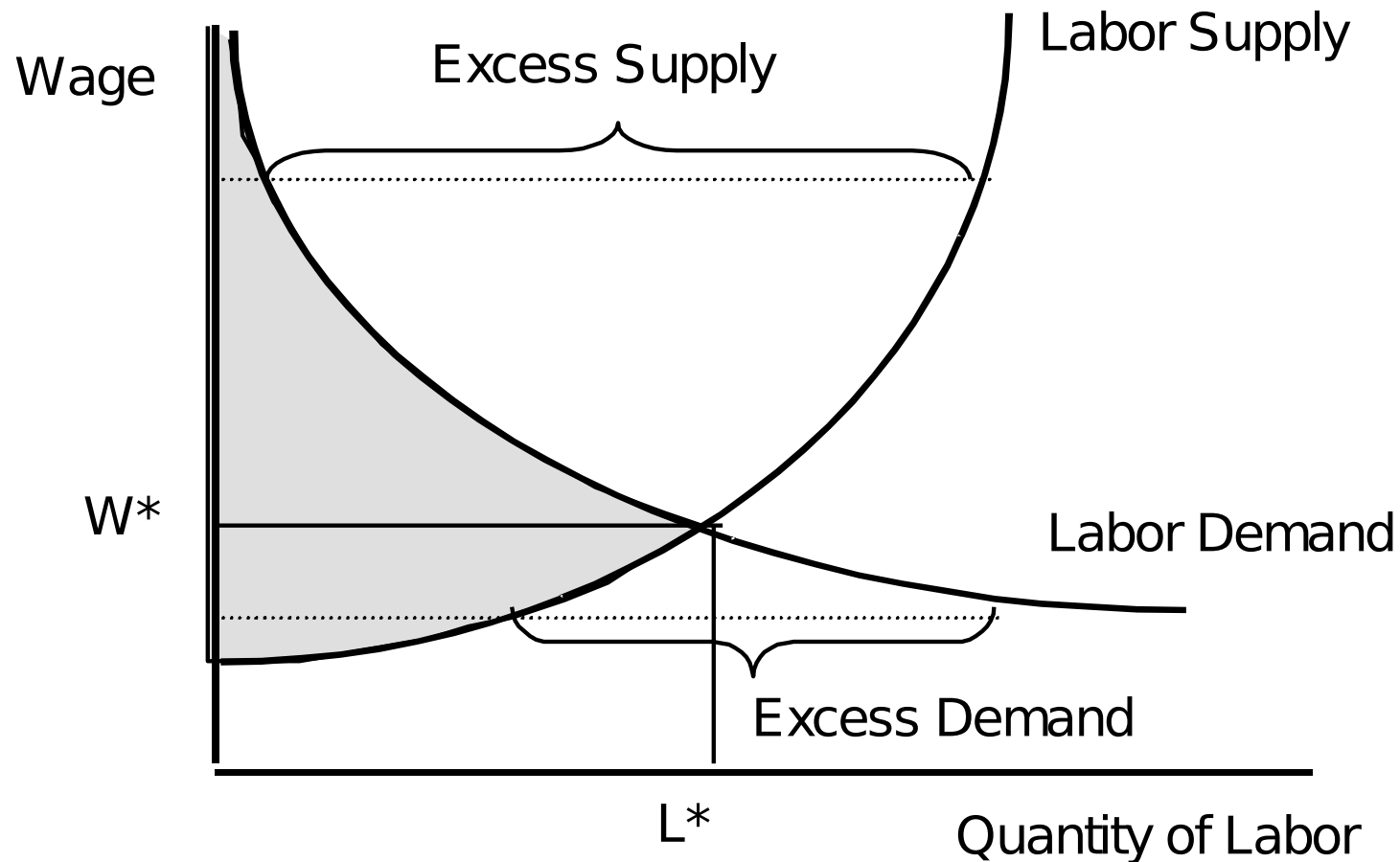
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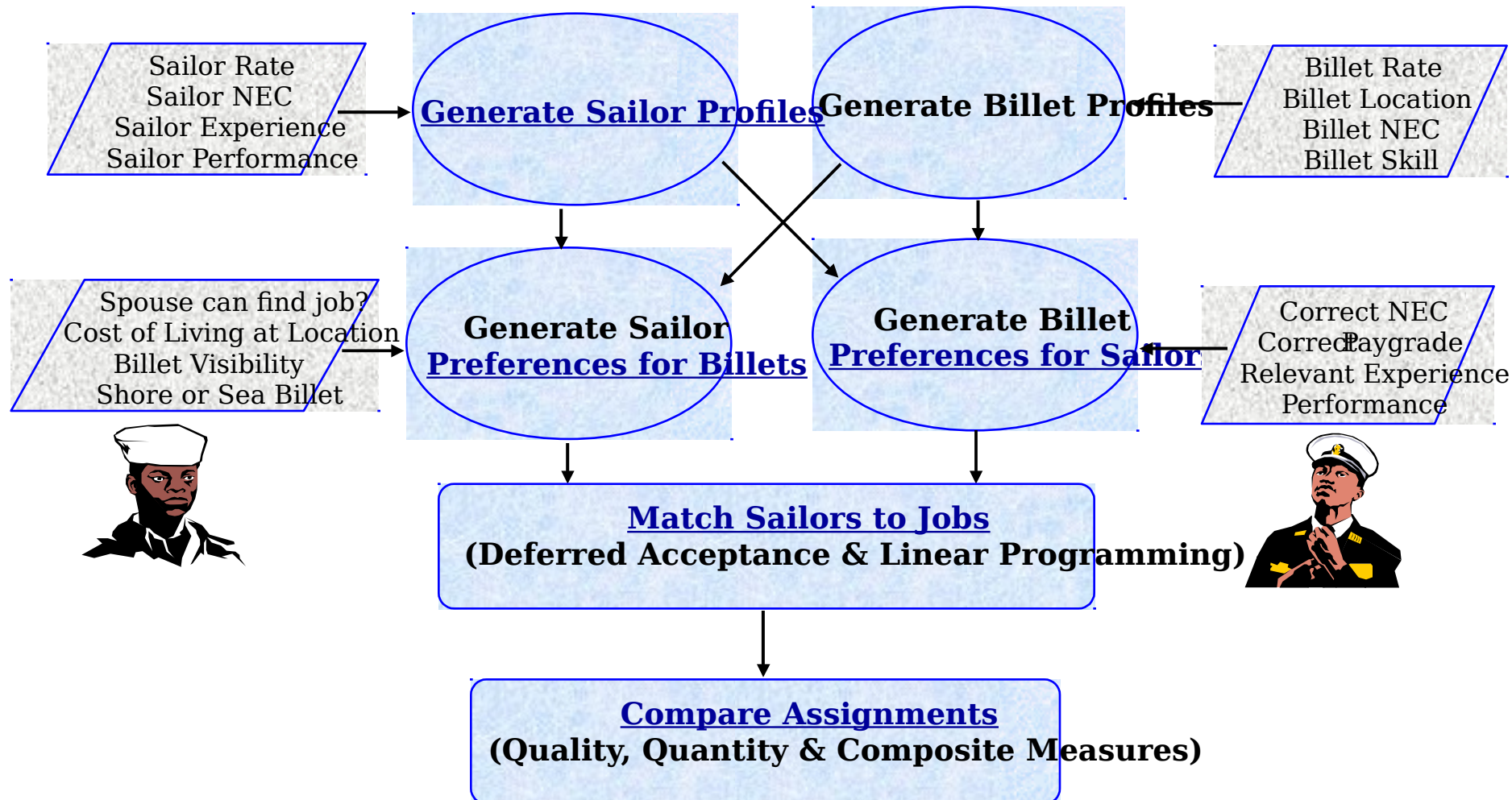
Research Questions

- What do we mean by a good fit between and sailor and a command?
 - Quantity
 - Quality
- What is the relative performance of the LP and the DA matching algorithm when applied to the U.S. Navy's enlisted assignment process?
- Sponsor: NPRST - PERS 1

Labor Markets



Navy Enlisted Detailing Simulation Model: NEDSim



Optimization

- Maximize quality of fit (minimize quasi-prices)
 - Minimize sailor/command rank-order-preferences (ROP)
 - Maximize sailor/command utility
 - Use weighted average ROP/utility
 - ❖ $0.5U_s + 0.5U_c$

Two-sided Matching

Example: Sailor-Bias

Sailor #1 **Sailor #2** **Sailor #3** **Sailor #4** **Sailor #5**




6 6 **2** 6 6
3 3 5 8 8
4 4 7 3 3
8 8 3 4 4
2 2 4 1 2
5 5 6 2 5

Comd #1 **Comd #2** **Comd #3** **Comd #4** **Comd #5** **Comd #6** **Comd #7** **Comd #8**

2 2 2 2 2 4 2 2
5 5 5 5 5 2 4 1
1 1 1 1 1 3 1 4
4 4 4 4 4 1 3 3
3 3 3 3 3 5 5 5

Sailor 1	Sailor 2	Sailor 3	Sailor 4	Sailor 5
6	6	2	6	6
3	3	7		8
4				

Evaluation Criteria

- Quantity measure
 - ❖ Percentage Matching 
- Quality measure
 - ❖ Percentage Average Utility 
 - ❖ Percentage Unstable Matches 

Findings: Priority 1 Billets

	Sailors		Commands	
	DA	LP	DA	LP
Percent Matched	17.7%*	19.8%*	88.2%*	98.8%*
Percent Average Utility	66.8%	68.7%	73.6%*	78.2%*
Percent Unstable	0.0%	22.0%	0.0%	22.0%

***Significant at the 95% level**

Findings: Priority 2 Billets

	Sailors		Commands	
	DA	LP	DA	LP
Percent Matched	19.5%*	35.7%*	14.2%⁰	25.9%*
Percent Average Utility	85.1%	84.6%	67.3%*	38.7%*
Percent Unstable	0.0%	0.7%	0.0%	0.7%

***Significant at the 95% level**

Findings

- **More Robust Simulation**
 - Actual sailor and billet profiles
 - Actual sailor and command preference factors
- **Multiple Criteria for Success Defined**
 - Quantity Measure – Percent matched
 - Quality Measures – Average Utility, Percent Stable
- **Optimal algorithm depends on Navy's tradeoff between the quantity and quality performance measures**
 - Likely restricted to sailor rank order lists